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Oil price shocks and stock market returns: New evidence from the United States and China

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ABSTRACT

This study examines the time-varying correlations between oil prices shocks of different types (supply-side, aggregate demand and oil-market specific demand as per Kilian (2009) who highlighted that *"Not all oil shocks are alike"*) and stock market returns, using a Scalar-BEKK model. For this study we consider the aggregate stock market indices from two countries, China and the US, reflecting the most important developing and developed financial markets in the world. In addition to the whole market, we also consider correlations from key selected industrial sectors, namely Metals & Mining, Oil & Gas, Retail, Technology and Banking. The sample period runs from 1995 until 2013. We highlight several key points: (i) correlations between oil price shocks and stock returns are clearly and systematically time-varying; (ii) oil shocks of different types show substantial variation in their impact upon stock market returns; (iii) these effects differ widely across industrial sectors; and finally (iv) China is seemingly more resilient to oil price shocks than the US.

1. Introduction and brief review of the literature

In this paper we extend the works of Kilian (2009) and Kilian and Park (2009) by examining how the financial returns of the aggregate stock market and of key industrial sectors co-vary with different types of oil price shocks, and how this co-variance has strengthened (or weakened) over time. In particular, dynamic conditional correlations are evaluated using the Scalar-BEKK model proposed by Engle and Kroner (1995) to examine the aforementioned time-varying relationship.

The pioneer in the study of oil prices and macroeconomic indicators was Hamilton (1983). Since then a vast amount of studies have been published and the majority of them voice the opinion that oil prices exert a significant impact on economic variables (some influential papers include, inter alia, Baumeister and Peersman, 2012; Lippi and Nobili, 2012; Segal, 2011; Rahman and Serletis, 2011; Tang et al., 2010; Jbir and Zouari-Ghorbel, 2009; Nakov and Pescatori, 2010; Blanchard and Gali, 2007; Hamilton, 2008, 1996; Hamilton and Herrera, 2004; Barsky and Kilian, 2004; Jones et al., 2004; Leduc and Sill, 2004;

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Brown and Yücel, 2002; Hooker, 2002, 1996; Amano and Van Norden, 1998; Bernanke et al., 1997; Rotemberg and Woodford, 1996; Huang et al., 1996; Darrat et al., 1996; Mork et al., 1994; Hutchison, 1993; Mork, 1989 and Burbidge and Harrison, 1984). Despite the fact that the oil literature dates back into the early 80s, the relationship between oil prices and stock markets has received a marked increase in attention by researchers only over the last two decades.[1] The picture that is painted by these studies advocates in favor of a negative relationship between oil price changes and stock market performance (see, inter alia, Asteriou and Bashmakova, 2013; Filis and Chatziantoniou, 2014; Ciner, 2013; Lee and Chiou, 2011; Laopodis, 2011; Filis, 2010; Chen, 2009; Miller and Ratti, 2009; Driesprong et al., 2008; Nandha and Faff, 2008; O'Neill et al., 2008; Park and Ratti, 2008; Bachmeier, 2008; Henriques and Sadorsky, 2008; Sadorsky, 2001; Papapetrou, 2001; Ciner, 2001; Gjerde and Sættem, 1999; Huang et al., 1996; Jones and Kaul, 1996).

Furthermore, the literature had remained generally silent until very recently regarding the effects of oil prices on the stock market industrial sectors. Some interesting studies include those by Degiannakis et al. (2013), Scholtens and Yurtsever (2012), Arouri (2012), Broadstock et al. (2012), Narayan and Sharma (2011), Arouri (2011), Elyasiani et al. (2011), Mohanty et al. (2011), Arouri et al. (2011), Arouri and Nguyen (2010), Kilian and Park (2009), Nandha and Faff (2008), Boyer and Filion (2007), El-Sharif et al. (2005) and Hammoudeh and Li (2005). The general consensus from these studies is that the Oil & Gas sector, and also the Mining sector, tends to be positively affected by positive changes in oil prices, whereas the reverse holds true for other sectors, such as Transportation, Manufacturing, Food, Chemicals, Medical, Computer, Real Estate and General Services. Inconclusive results are reported for the Electricity, Engineering and Financial sectors. Thus, overall it could be suggested that there is a positive effect of the oil prices on oil-related and oil-substitute sectors, a negative effect on oil-using sectors and not a significant effect on non-oil-related sectors (such as the financial sector).[2]

Following Hamilton (2009a,b) and Kilian (2008a,b, 2009), we also subscribe to the belief that we cannot paint a complete picture on the relationship between oil prices and the economy or the financial markets, unless we separate the origins of the oil price shocks. These authors were the first to distinguish between supply-side and demand-side oil price shocks, arguing that these shocks would trigger different responses from the economic indicators and financial markets. We should add here that Kilian (2009) disentangles further the demand-side oil price shocks into aggregate demand shocks and precautionary demand shocks (or oil-market specific demand shocks) in an effort to capture the oil price shocks that originate from an increase in world aggregate demand and those that originate from the increased demand due to uncertainty about the future availability of oil, respectively. Pertaining to the readily available information, a positive relationship has been established between aggregate demand shocks and economic and/or stock market developments, whereas a negative relationship holds during oil-market specific demand shocks. At this point it is worth noting that at the other end of the spectrum, there is a growing body of literature shaping around the concept that supply-side oil price shocks do not exercise any effects anymore on either the economy or the financial markets (see, inter alia, Degiannakis et al., 2014; Abhyankar et al., 2013; Kang and Ratti, 2013; Baumeister and Peersman, 2012; Basher et al., 2012; Lippi and Nobili, 2012; Kilian and Lewis, 2011; Kilian and Park, 2009; Hamilton, 2009a,b; Kilian, 2009; Apergis and Miller, 2009; Lescaroux and Mignon, 2009; Kilian, 2008a,b; Barsky and Kilian, 2004). Nevertheless, Chen et al. (2014) focus on France, Germany, Japan, the UK and the US and report that supply side shocks exercise a more persistent effect on stock prices.

The aforementioned studies, though, have largely ignored the importance of examining the relationship between oil prices and stock markets in a time-varying environment. Time-varying correlation models have only very recently been applied to investigate oil and stock market relationships. Some notable studies include for instance Choi and Hammoudeh (2010) who apply the dynamic conditional correlation model (DCC) to investigate relationships between commodity prices including oil, copper, gold and silver, with the S&P 500 index and show evidence of increasing correlations between all commodities since 2003 but decreasing correlations with the stock index. Similarly, Chang et al. (2010) show that in the US, conditional correlations between crude oil prices and stock returns are not constant. Filis et al. (2011) go further and separate oil importing from exporting countries in their analysis and, using a DCC generalized autoregressive conditionally heteroskedastic (DCC-GARCH) specification, show that during oil-market specific demand shocks a negative relationship between oil and stock market returns exists, whereas a positive correlation was observed during aggregate demand shocks. More recently, Broadstock et al. (2012) use a BEKK model to identify the time-varying relationship between oil prices and energy related stocks in China, identifying a sharp increase in correlation during the 2008 financial crisis, while Antonakakis and Filis (2013) examine the time-varying effects of oil prices changes on stock market correlation, using a DCC-GARCH model.

This paper links two strands of the literature (oil-price shocks and time-varying correlation between oil price and stock market returns) in an effort to reveal some rather important findings which have not been reported previously. Overall, the innovations of this paper can be described succinctly as follows. First, we disentangle oil prices into specific shock series using Kilian's (2009) framework, namely supply, aggregate demand and oil-market specific demand based shocks. Using

[1] It is not immediately clear why this surge of study has been within the past decade or so, but several points may contribute: first the availability of daily data online through numerous web portals has been massively improved; second the methods for handling volatile data were not 'mainstream' until recent years; and third the sheer volume of papers being published has risen dramatically in the last few years (particularly in some leading energy related journals), generating a sheer scale effect.

[2] Gogineni (2010) offers compelling justification and logic behind these general findings noting that supply chain dependency (and hence exposure) to oil markets is key to determining the relevance of oil price changes in any given sector.